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Zero Retries is an independent newsletter promoting technological innovation in Amateur Radio, and Amateur Radio as (literally) a license to experiment with radio technology.

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Request To Send

By Steve Stroh N8GNJ

The Evolution of Amateur Radio Operator's Skillsets

As I completed this issue of Zero Retries, it struck me that the three very accomplished Amateur Radio Operators mentioned in this issue (K1JT, WA3FET, N1UL) all embraced their Amateur Radio experience and used that experience to good effect in their their *technical* careers.

That's also happening in Amateur Radio as a whole, but slowly enough that most don't recognize that it's happening. Amateur Radio Operators used to be communications specialists - we knew how *operate* radios such as when using a High Frequency (HF) radio was a complex interplay of choosing an appropriate band, tuning the transmitter to match the antenna and frequency, etc. That was a rare, and valuable skill.

But in this era, there's less call for those kinds of skills given that technology has evolved to automatic tuning of HF - just choose a frequency, transmit, and the radio takes care of all the tuning. Ditto the "Push the button to communicate" nature of Iridium satellite phones (and Push To Talk units), FirstNET's "hardened" portion of the AT&T broadband wireless network, and most recently, Broadband Internet, nearly anywhere nature of the Starlink satellite network - just power it up and connect to the Wi-Fi and you're online at broadband speeds.

But now that we've become a technological society utterly dependent on radio technology (we're pretty helpless when the mobile networks go down), new skills are needed - understanding and troubleshooting radio technology issues. Increasingly, Amateur Radio Operators are empowered to provide such skills. Some examples:

- Tracking down radio troublemakers. This used to be exclusively the responsibility of the Federal Communications Commission (FCC), but now that organization only gets involved in the most egregious problems… or when a broadcaster complains. Because Amateur Radio Operators have hands-on experience with antennas, they intuitively understand directionality of antennas and it's an easy transition to understand the basics of directional location of transmitters.

- Even though two-way radios have become just another consumer device, such as Family Radio Service (FRS) units, there's a severe mismatch between the manufacturer's advertised capabilities (*up to 20 miles!*) and the *actual* capabilities of such units. When FRS units are used at scale (for example, a parade) they fall down, and the "civilians" don't have any idea why. Amateur Radio Operators, with experience with both simplex, and repeater operation, are in a position to explain and help and help build a communications system that works.

- Amateur Radio has always promoted Amateur Radio Operators to "have a plan for when the power *does* go out". This takes many forms, from the mundane measure of buying the optional AA battery pack for your portable radio so that you can use cheap, plentiful AA alkaline batteries to keep your portable radio working indefinitely, to the "*my* Amateur

Radio Station can operate for *days* on my big battery backup system with solar panels". That perspective is now badly needed as the US electrical grid is evolving unevenly with new sources of power, more demand, and the slow pace to add new transmission lines to balance those demands. Thus Amateur Radio Operators can help coach families to plan ahead, realistically, for when the power does go out.

- Thanks to the low barrier to entry of the Amateur Radio Emergency Data Network (AREDN) technology Amateur Radio Operators are getting familiar with building wireless, high-speed, ad-hoc networks and deploying modern IT infrastructure. "Civilians" wouldn't normally deploy remote high definition cameras, or operate (or use) a Voice Over Internet Protocol (VOIP) telephone or VOIP switch such as Asterisk, but those activities are routine now in many AREDN networks.

- Amateur Radio Operators who take up the challenge of understanding the Flipper Zero (see below) can help troubleshoot issues like self-install home security systems don't work (they use 433 MHz and there's interference), the perils of using radio remote controls for access control (not very secure these days), etc. The Flipper Zero helps teach some aspects of radio technology, but in the hands of an Amateur Radio Operator with a much broader understanding of radio technology, the Flipper Zero can be much more useful.

I'll stop there, but I'm sure you get the idea. Amateur Radio Operator's skills are evolving… *as they always have*. It's just harder to see that evolution in *this* era because there's so much else going on in our technologically assisted lives, such as the sudden burst of consumer access to Artificial Intelligence (AI), "5G" (don't get me started on *that* boondoggle), the rapid uptake of Battery Electric Vehicles (BEVs), etc.

Thus, my perspective is that Amateur Radio *matters*. Sometimes in the blur of life, and the fun we have with it, it's easy to forget that perspective. But without that perspective - that Amateur Radio *matters*, I probably wouldn't have remained involved in Amateur Radio (for decades now), and I wouldn't have bothered to start Zero Retries.

Your mileage may vary.

ZR > BEACON Near Buffer Overflow

There were so many ZR > BEACON items this week that I almost lapsed into doing a ZR > BEACON Edition again, but as I've previously discussed, that's not sustainable. Thus I'll cram as as I *can* into each single issue of Zero Retries, push some (in the end, five BEACON items) into future issues to keep this issue at a reasonable size, and call it good. It's a fun problem to have - there is *so* much Zero Retries Interesting activity going on in Amateur Radio of late, and there's *always* exciting things to report in Zero Retries *every week*.

Zero Retries Domain is (Still) Unchanged

I had an unexpected event on the day I planned to migrate the URL for Zero Retries - from https://zeroretries.substack.com to https://zeroretries.org. The next attempt is queued for the week of 2023-04-30.

Leave a comment

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New BTECH UV-25X2 / UV-25X4 Radios Include Data Capability

By Steve Stroh N8GNJ

BTECH just announced two new radios that offer some "built-in" data capability.

Image courtesy of BTECH

The new UV-252X2 and UV-25X4 (the latter includes the 222-225 MHz band) from BTECH have a significant improvement over the previous generation:

> Innovative Audio I/O Features: Harness the power of the UV-25X2 and UV-25X4's audio I/O capabilities by pairing them with a cable like the APRS-K1. Effortlessly transmit and receive APRS and packet data, capture location data, or even send messages directly from your radio through the RJ45 jack. The possibilities are truly endless!

After some careful reading to parse that breathless advertising prose, it appears that the primary

(Zero Retries Interesting) improvement from the previous versions is the option (menu selectable) of routing receive audio onto a pin on the RJ45 microphone connector. This is made clearer in this statement from the UV-252X2 web page:

> **RJ45 Audio Input & Output**
> The UV-25X2 has new menus and operations that allow audio I/O from its RJ45 microphone port. This allows the UV-25X2 to be installed for custom applications, where users want more control on where the speaker and mic audio is routed to.

BTECH's implementation of this capability uses a "splitter" cable (included) that plugs into the RJ45 microphone connector.

> **RJ45 to K1 Audio Adaptor**
> The UV-25X2 [and UV-25X4] also includes a RJ45 to K1 Audio Adaptor, allowing you to use K1 audio accessories from our BTECH handheld radios with your mobile radio!
>
> The radio includes special menus to allow audio to be routed both through the UV-25X2 and K1 accessory, only through the radio, or only through the K1 audio accessory.

One side of the "RJ45 to K1 Audio Adapter" is for the microphone, and the other side of the adapter emulates the dual 3.5mm external speaker / microphone connectors on modern portable radios. The latter is intended to be used with the BTECH APRS-K1 Audio Cable.

The "APRS-K1" is intended to connect a BTECH portable radio to a mobile phone and thus terminates in a 4-connection 3.5mm jack. BTECH's use case for the combination of the "RJ45 to K1 Audio Adapter" and the "APRS-K1 Audio Cable" is to operate APRS on a mobile phone:

> APRSpro, APRSDroid, Compatible – Android, iOS

Some *tentative* conclusions on these new radios:

- There are "lumps" in the two BTECH cables / adapters, so there's likely some circuitry embedded in them. There's no mention in the sales pages about whether the two BTECH cables are *required* to use the new audio capabilities of these radios.

  Hopefully, all that's required to use these radios for data communications with audio adapters such as a SignaLink USB or a DRA-54 is a simple RJ45 to RJ45 cable. Perhaps unique pin-to-pin wiring will be required, but that's easily accommodated with RJ45 cables. There's another very brief blurb in the second graphic on the left on the product pages that hints that a simple cable will work:

  > Build custom accessories or hook up to intercom.

- These radios are inexpensive; factory direct prices are $125 for the UV-25X2 and $135 for the UV-25X4.

- The UV-25X4 is a full tri-band unit - 144-148 MHz / 222-225 MHz / 440-450 MHz. *Per*

the specifications, the 222-225 MHz section transmits at the same power levels as the other two sections. Similar radios that have included 222-225 MHz are significantly lower power, such as 5-10 watts. Perhaps this is what was mentioned in the statement "BTECH radios use an upgrade Power Chipset".

Unfortunately, N8GNJ Labs is overflowing with way too many projects in progress. Thus, despite the reasonable prices, I'm going to have to leave the "let's check them out" experimentation for someone else(s). I look forward to reading about usage of these radios for data communications. I'm especially interested in hearing / reading more about:

- If my supposition is correct and all that's required to use an audio adapter with these radios is a simple RJ45 to RJ45 cable?
- If the menus have any mention of flat audio capability (often referred to as "9600 mode") to accommodate higher data speeds?
- What speeds *can* be achieved with VARA FM1?

My thanks to Kevin Custer W3KKC for pointing out these new radios.

Leave a comment

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

Presentation to Mount Baker ARC Digital Group

On 2023-04-18 I did a brief presentation to the Mount Baker Amateur Radio Club's (MBARC) Digital Group (DG). The idea was suggested by DG President, Budd Churchward WB7FHC. He suggested that I pick a few story ideas from the past month of Zero Retries that would be of interest to the DG and present them in a 5-10 minute segment. The topics I chose for this month were:

- Tigertronics Microphone Adapters
- Masters Communications Multiple Modem to Single Radio Multiplexers
- New 222-225 MHz Mobile Radio from Alinco
- USB Over Ethernet With a Raspberry Pi and VirtualHere Software

I was delighted and honored to do this. The DG is my local "Amateur Radio Digital" organization, and when I attend their meetings, I always learn something new.

This presentation may be the first of a series of ongoing presentations (segments) of future DG meetings. We'll see how it goes for the DG and for me.

TAPR / AMSAT Banquet at Hamvention 2023

> The 14th annual TAPR/AMSAT Banquet will be held at the Kohler Presidential Banquet Center on Friday, May 19th at 18:30 EDT. This dinner is always a highlight of the TAPR (Tucson Amateur Packet Radio) and AMSAT (Radio Amateur Satellite Corp.) activities during the Dayton Hamvention. This year's banquet speaker will be announced in the coming weeks.

I've attended this event a number of times, and it's wonderfully *fun* for the Zero Retries Interesting conversations you'll overhear or participate in that technical crowd. There have been some stellar speakers at this event, and if I was able to attend Hamvention 2023, I would be there. My thanks to Jeff Davis KE9V for reminding me to mention this event.

2023 Hamvention Awards

Speaking of Hamvention 2023, there were a couple of Zero Retries Interesting recipients.

> **Amateur Radio Club of the Year**
> The Delaware Valley Radio Association (DVRA), an ARRL affiliated club formed in 1930, serves the Trenton, New Jersey metropolitan area.
> …
> The recent addition of 1296 MHz EME capability has been optimized with the assistance of member Joe Taylor (K1JT).

I think that any Amateur Radio club that can claim K1JT2 as a member has an unfair advantage for Amateur Radio Club of the year. (I'm just jealous.)

> **Technical Achievement Award**
> Dr. James Breakall's [WA3FET] work has been instrumental in amateur radio antenna technology development for decades. He has teamed with many experts in the field to develop state of the art advancements with a wide range of applications, including the Numerical Electromagnetic Code (NEC).

WA3FET is an embodiment of the second part of the opening statement of Zero Retries: … ***Amateur Radio as (literally) a license to experiment with radio technology.***

IEEE Spectrum Reviews the Flipper Zero

Ask any hacker what a Flipper Zero is and they'll break into a wide grin. Tersely, it's an open source wireless hacking tool that's useful to the point where Amazon decided not to allow them to be sold on its platform. I've seen several articles about the Flipper Zero and all of them were too fawning and "hacker insider" to be readable. *This* article is a readable, sober explanation.

> The Flipper Zero: A Hacker's Delight
> *Depending on your job, you'll love or hate this wireless multitool.*
>
> Readers of this Hands On are likely to fall into one of two camps: those who'll view the Flipper Zero with fascination, and those who'll view it with loathing. Among the former are security researchers and hardware developers trying to debug a wireless setup. Among the latter are IT folks charged with defending their realm from physical or network attacks. But whatever camp you fall into, the Flipper is something you'll need to know about.
>
> The Flipper is an open-source hacking tool of exceptional polish and functionality. Its official price is US $169, but it sells out as fast as it can be manufactured and so can often only be found at a hefty markup—I paid $250 from one reseller.

I highly recommend this article to understand (at least some of) what's happening in the world of wireless hacking. The technology behind the Flipper Zero will touch… or perhaps already *has* touched… Amateur Radio, such as decoding device transmissions on 433 MHz, which overlaps with Amateur Radio. Think of it as a protocol analyzer for common wireless signals.

Scott Tilley VE7TIL Asks the Hamverse for a Dish

On Mastodon - @coastal8049@mastodon.social, VE7TIL said:

> I rarely ask for help in obtaining something material. But I was wondering if the community could help me find a 1-1.2m solid AL dish antenna. I would like to upgrade the 0.6m Mighty Little Dish on X (Don't tell him that thou).
>
> The Empire will compensate accordingly...

For context, VE7TIL is *extraordinarily* active on observing and analyzing satellite transmissions as a talented amateur - and publishing his findings. One of his most prominent discoveries was finding a NASA satellite previously declared dead. It would be nice if the Hamverse could offer an assist to VE7TIL for this modest request. If you're not on Mastodon, you can probably contact VE7TIL via his blog's contact page.

IEEE Communications Society Distinguished Industry Leader Award for 2023 is Ulrich Rohde N1UL

> … for contributions and leadership in radios and electronic test-measurement equipment that has supported the design of modern communication systems and their industrial implementations.
>
> [N1UL] has published 400+ scientific papers, co-authored over dozen books, with John Wiley and Springer and [holds] over 4 dozen patents…

In doing some research for this item, I found the Rohde Foundation page, where it mentions:

> In 2017 he was also the recipient of the Leadership Award of the Wireless Innovation Forum (formerly Forum International Achievement Award), which is presented to an individual, group of individuals, or organization that made especially significant contributions in furthering the global mission of the Wireless Innovation Forum. **Dr. Rohde was recognized as the inventor of the software defined radio (SDR)** and was among the first to present publicly on this topic with his 1985 talk, "Digital HF Radio: A Sampling of Techniques," at the Third International Conference on HF Communication Systems and Techniques in London.

With talent such as N1UL, K1JT, and WA3FET in our ranks, we're in good company as Amateur Radio Operators.

AREDN 802.11n to 802.11ac Device Migration Chart (Now Official)

Amateur Radio Emergency Data Network (AREDN) software now supports a number of 802.11ac (newer Wi-Fi technology) units. Orv Beach W6BI had previously published an informal guide to migrating older devices to an 802.11ac equivalent. Now that guide is "officialized" by being available on the AREDN Website: 802.11n to 802.11ac Device Migration Chart.

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Feedback Loop

Comments:

Thank you Jordan and K4HCK, Cale for commenting on Zero Retries 0095. Greatly appreciated!

If you provide feedback via email, I may excerpt your feedback or include it in full. Unless you specifically grant me permission to include your name, I won't do so. Feedback may be lightly edited for clarity.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out
Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing ***Thanks*** to:

- Tina Stroh KD7WSF for, well, *everything!*
- **Pseudostaffers** that write about about "Zero Retries Interesting" items on their blogs that I don't spot:
    - Dan Romanchik KB6NU
    - Jeff Davis KE9V
- **Newsletters** that regularly feature Zero Retries Interesting content:
    - Amateur Radio Weekly by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
    - Experimental Radio News by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC.
    - TAPR Packet Status Register has been published continuously since 1982.
    - Other Substack Amateur Radio newsletters recommended by Zero Retries.
- **YouTube channels** that regularly feature Zero Retries Interesting content:
    - HB9BLA Wireless by Andreas Spiess HB9BLA
    - KM6LYW Radio by Craig Lamparter KM6LYW (home of the DigiPi project)
    - Modern Ham by Billy Penley KN4MKB
    - Tech Minds by Matthew Miller M0DQW
- The Substack email publishing platform makes Zero Retries possible. I recommend it for publishing newsletters.

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Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

Zero Retries / N8GNJ on Mastodon

Email issues of Zero Retries are "instrumented" by Substack to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- SuperPacket blog — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- N8GNJ blog — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ / WRPS598 (He / Him / His)
These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham (The City of Subdued Excitement), Washington, USA.

2023-04-28

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1

VARA FM is fast becoming the benchmark application for data communications using off-the-shelf VHF / UHF Amateur Radios.

2

K1JT is better known beyond Amateur Radio as a Nobel Prize laureate.